Contribution ID: **53** Type: **60s-Pitch + Scientific Poster**

Microbially Mediated Weathering Pathways along the Chilean Climate Gradient

Traditionally, mineral weathering has been considered to be driven mainly by abiotic factors. However, recent studies have revealed that microorganisms can survive, sustain metabolic activity, and even actively contribute to mineral weathering. Even under extremely dry and oligotrophic conditions, microorganisms play a significant role in the formation and development of Earth's soil through their metabolic activity on the surface of mineral rocks. In the context of today's global climate change, understanding microbially mediated weathering has become increasingly important. Climate is one of the major drivers shaping the composition and functional potential of microbial communities, which in turn influences how microorganisms contribute to weathering and pedogenesis. In this study, we aim to investigate how microorganisms and climate interact to drive granite weathering, focusing on sites sharing the same granite bedrock but characterized by different climates (arid, semi-arid, Mediterranean, and humid) along the Chilean Coastal Cordillera. Intracellular (iDNA) and extracellular DNA (eDNA) extraction techniques will be employed to identify microbial communities that are alive and actively participate in the weathering process. Subsequently, metagenomic and metatranscriptomic analyses will be conducted to understand the metabolic pathways involved in microbially mediated weathering across the gradient. This work is expected to provide a comprehensive understanding of climate-driven shifts in microbial functional potential and to improve predictions of the future microbially mediated weathering processes under changing climates.

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